4. [4 points] Evaluate the following limits. No justification necessary. Write DNE if a limit does not exist or diverges to $\pm \infty$.

i.
$$\lim_{x \to \infty} \frac{(3x^2 + 1)(x^3 - 2x + 5)}{1 - x - x^2 - x^3 - x^4}$$

Answer: DNE

ii. $\lim_{x \to \infty} \frac{\ln x}{\sqrt{x}}$

Answer: 0

iii. $\lim_{x \to \infty} \left(\frac{xe^{-x} + e^x}{xe^{-x} - e^x} \right)$

Answer: -1

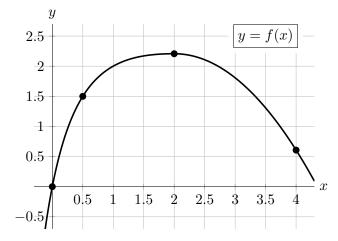
iv. $\lim_{x \to \infty} \frac{(3+x^{-1})^2 - 9}{x^{-1}}$

Solution: If we let $f(x) = x^2$, then this limit is f'(3), which is 6. Alternatively,

$$\lim_{x \to \infty} \frac{\left(3 + x^{-1}\right)^2 - 9}{x^{-1}} \ = \ \lim_{x \to \infty} \frac{9 + 6x^{-1} + x^{-2} - 9}{x^{-1}} \ = \ \lim_{x \to \infty} \left(6 + x^{-1}\right) \ = \ 6.$$

Answer: 6

- 5. [6 points] A portion of the graph of the differentiable function f(x) is shown below to the right. Using this graph, put the eight quantities (a) through (h) in order from least to greatest by writing the letters on the blanks. You are given that f(x) is quadratic on the interval (2,4).
 - (a) f'(0)
- (c) f'(2)
- (b) f'(0.5)
- (d) f''(3)
- (e) the average rate of change of f(x) over [0, 0.5]
- (f) the average rate of change of f(x) over [0.5, 2]
- (g) the average rate of change of f(x) over [0,4]
- (h) the number 1



LEAST GREATEST